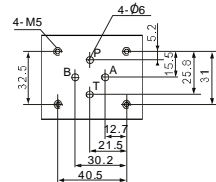




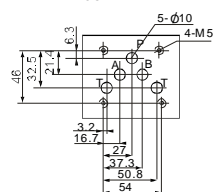
### 底板尺寸 Subplate Size

BFW-02



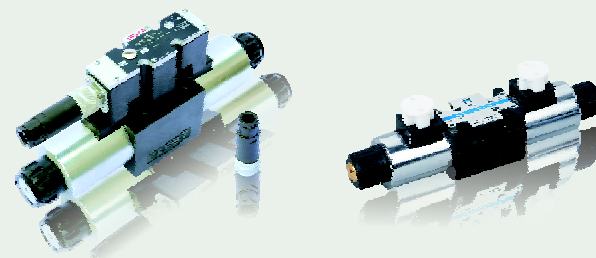
O形圈 O-ring: 8.73×1.78  
阀固定螺钉 Valve fixing screw: 4-M5×45-12.9  
(GB70-85)

BFWN-03



O形圈 O-ring: 12×2  
阀固定螺钉 Valve fixing screw: 4-M6×35-12.9  
(GB70-85)

### Directional Proportional valve



### 比例方向阀

二位四通和三位四通比例方向阀直控式  
阀芯不带位移电反馈  
型号BFW和BFWN

The 4/2 and 4/3-way proportional directional  
valves, direct operated  
without electrical position feedback.  
Type BFW and BFWN



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NINGBO HOYEA MACHINERY MANUFACTURE CO.,LTD.

宁波华液电液控制工程股份有限公司

NINGBO HOYEA ELECTRO-HYDRAULIC CONTROL ENGINEERING CO.,LTD.

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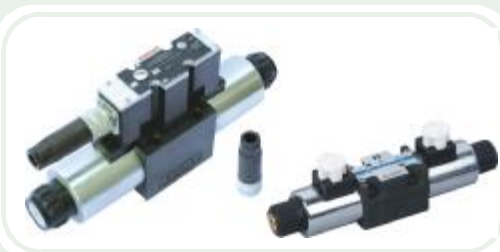
The first edition in September 2008  
If there are changes with the technical parameter of our products, sorry for without information.  
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## 比例方向阀 Directional Proportional Valve

二位四通和三位四通比例方向阀直控式  
阀芯不带位移电反馈  
型号BFW和BFWN

The 4/2 and 4/3-way proportional directional valves, direct operated without electrical position feedback.  
Type BFW and BFWN

通径6和10 Nominal sizes 6 and 10  
2X系列 Component series 2X  
最高工作压力 Maximum operating pressure 315 bar  
最大流量 Maximum flow 42 L/min 通径 6 (NS6)  
最大流量 Maximum flow 75 L/min 通径 10 (NS10)



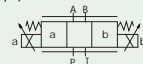
BFW					-2X / G24				V	*
不带内置放大器 Without integrated electronics	=无代号 No code									其他要求用文字说明 Further details in clear text
带内置放大器 With integrated electronics	=N									V= 氟橡胶密封, 适用于符合 DIN 51 524标准的液压油(HL, HLP) NBR seals suitable for mineral oil (HL, HLP) to DIN 51 524
通径(NS)6	=02									无代号 No code= 用于 BFW及BFWN For BFW and BFWN
通径(NS)10	=03									A= 给定值输入 input Command value $\pm 10V$ F1= 给定值输入 input Command value $\pm 20mA$
图形符号 Spool Symbols										<sup>2</sup> K4= 电气接线 Electrical connection For BFW型: 带符合 DIN EN 175 301-803的插座参考第3页 with plug component DIN EN 175301-803 See page 3 For BFWN型: 带符合 DIN 43 650-AM2的插座参考第4页 with plug component DIN 43 650-AM2 See page 4
										无代号 No code= 特殊保护 Special protection: <sup>1</sup> J= 无特殊保护 Without special protection 抗海水腐蚀(适用于通径6) Seawater-resistant (only for NS6)
										G24= 24V直流电源 24 volt DC
										2X= 20至29系列(20至29系列: 安装和连接尺寸不变) Component series 20 to 29 (20 to 29: unchanged installation and connection dimensions)
										阀的压差为10 bar时的额定流量 Nominal flow at valve pressure differential $\Delta p = 10 \text{ bar}$ : 通径(DN)6 7 L/min 15 15 L/min 30 26 L/min 30 30 L/min 60 60 L/min

1)有关电气保护的内容请向我们咨询。  
1. Other types of electrical protection on request

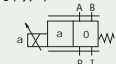
2)只用于6通径: 对于保护型式“J”抗海水腐蚀, 只能选“K31”!  
2. Only available with 6 DN: We can only supply “31” in seawater resistant design “J”!

## 不带内置放大器的比例方向阀 Directional Proportional valve without integrated electronics

型号(type)BFW...

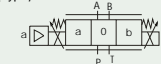


型号(type)BFW...A...

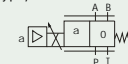


## 带内置放大器的比例方向阀 Directional Proportional valve with integrated electronics

型号(type)BFWN...



型号(type)BFWN...A...



## 功能说明和剖面图 Structure and function description, section

该二位四通和三位四通比例方向阀为直控, 板式结构; 由比例电磁铁操作, 比例电磁铁带中心螺纹, 线圈可单独拆卸, 电磁铁的控制可通过外部放大器(BFW型)或内置的放大器(BFWN型)实现。

The 4/2-way and 4/3-way proportional directional valves are designed as direct operated components by subplate mounting. They are actuated by means of proportional solenoid with central removable coil. The solenoid are controlled either by external control electronics (type BFW) or integrated control electronics (type BFWN).

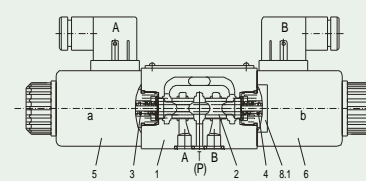
结构: 该阀由下列部分组成:  
—带安装底面的阀体(1)  
—带对中弹簧(3和4)的控制阀芯(2)  
—带中心螺纹的电磁铁(5和6)  
—可选带内置放大器(7)

工作原理:  
—电磁铁(5和6)不带电时, 对中弹簧(3和4)将控制阀芯(2)保持在中心  
—比例电磁铁得电被激励后会直接推动控制阀芯(2)  
例如: 控制电磁铁“b”(6)被激励  
→ 控制阀芯(2)被推向左侧, 位移与输入电信号成比例  
→ 这时, P口至A口及B口至T口通过阀芯与阀体形成的节流口接通, 节流特性为渐进式。  
—电磁铁(6)失电  
→ 控制阀芯(2)被对中弹簧(3)重新推回中心

Design: The valves basically consist of:  
-Housing (1) with mounting surface  
-Control spool (2) with compression springs (3 and 4)  
-Solenoids (5 and 6) with central coil  
-Optional integrated electronics (7)

Function:  
-With solenoids (5 and 6) release, the control spool (2) is held in the centre position by compression springs (3 and 4)  
-Direct actuation of the control spool (2) by energising a proportional solenoid  
E.g. energisation of solenoid “b” (6)  
→ The control spool (2) is moved to the left in proportion to the electrical input signal  
→ connection from P to A and B to T via orifice-like cross sections with progressive flow characteristics releasing of the solenoid (6)  
→ The control spool (2) is returned to the central position by compression spring (3)

型号(type)BFW-02...2X/...

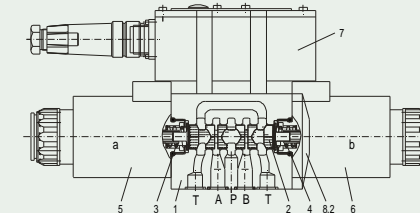


两位阀 Valve with 2 spool positions:  
(型号(type)BFW...A...)

这种结构的阀从原理上说与三位阀类似, 两位阀只带有电磁铁“a”, 对6通径的阀在第二个电磁铁的位置上装了一个丝堵(8.1), 对10通径的阀换成了盖(8.2)。

In principle, the function of this valve version corresponds to that of the valve with 3 spool positions. However, the valves with 2 spool positions are only fitted with solenoid “a”. Instead of the 2nd proportional solenoid a plug (8.1) is fitted with a cover for NS 6 or for NS 10 (8.2).

型号(type)BFWN-03...2X/...



对于型号BFW-02...2X/...说明:  
必须避免回油管路中的油全部排空, 必要时在回路中安装背压阀(背压约2 bar)。

Note for type BFW-02...2X/...:  
Draining of tank line is to be avoided. With the appropriate installation conditions, a back pressure valve is to be installed (back pressure approx. 2 bar).

## 技术参数 (使用时如果超出了规定的技术参数的范围, 请向华液公司咨询)

Technical data (For application outside these parameters please consult with us)

General	阀的型号 Type	BFW	BFWN
安装位置 Installation position	任意, 建议优先水平安装 optional, preferably horizontal		
储藏温度 Storage temperature range	℃	-20~80	
使用环境温度 Ambient temperature range	℃	-20~70	-20~50
重量 Weight	通径 DN6 kg	2.0	2.2
	通径 DN10 kg	6.6	6.8

## 技术参数 Technical data

工作压力 Operating pressure	油口Port A, B, P bar	至 315
	油口Port T bar	至 10
	通径DN6 L/min	7, 15和 (and) 26
	通径DN10 L/min	30, 60
额定流量 Nominal flow $q_{vnom}$ 在 $\Delta p=10$ bar时	通径DN6 L/min	42 (双流量回路可达 80) 80 with double flow
	通径DN10 L/min	75 (双流量回路可达 140) 140 with double flow
允许最大流量 Flow (max. Permissible)		
液压油 Pressure fluid	符合 DIN 51 524 标准的矿物油 (HL, HLP); 使用其它油液请向我们咨询! Mineral oil (HL, HLP) to DIN 51 524. For other fluid please consult with us.	
介质温度范围 Fluid temp. Range	°C	-20~80 (优先选择 +40~+50 is preference)
介质粘度范围 Viscosity range	mm <sup>2</sup> /s	20~380 (优先选择 30~46 is preference)
油液清洁度 Fluid cleanliness	油液最高污染等级按 NAS 1638 第9级 推荐过滤器最小过滤精度 $\beta_{x>75} X=10$ Maximum permissible degree of contamination of pressure fluid to NAS 1638 to 9 Recommended filter $\beta_{x>75} X=10$	
滞环 Hysteresis	%	≤ 5
反向误差 Reversal span	%	≤ 1
灵敏度 Response sensitivity	%	≤ 0.5

## 电磁铁的电气参数 Electrical

阀的型号 Type		BFW		BFWN	
电压类型 Voltage type		直流电源 Direct Voltage			
带 (Type) BFWN	电压输入 Voltage input "AI"	V	± 10	± 10	
给定值信号 Command signal	电流输入 Current input "FI"	mA	4~20	4~20	
每个电磁铁最大电流 Max. current per solenoid		A	2.5	2.5	
电磁铁线圈 Solenoid coil	20℃时的冷值 Cold value at 20℃	Ω	2	2	
电阻 Resistance	最大热值 Max. warm value	Ω	3	3	
通电率 Duty cycle	%	100			
最高线圈温度 <sup>2)</sup> Coil temperature		℃	可达 up to 150		
电气连线 见3页	BFW	带符合DIN 175 301-803及ISO 4400标准的插座 Plug-in connection to DIN 175301-803 and ISO 4400			
Electric connection see P3	BFWN	插头符合DIN 175301-803及ISO 4400 Plug-in connection to DIN 175301-803 and ISO 4400			
		带符合EN 43563-AM6-3标准的插座 Plug-in connection to DIN 43563-AM-3 and			
阀的保护形式符合标准 Type of insulation to DIN 40 050			IP 65		

## 放大器的电气参数 Control electronics

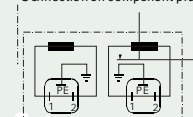
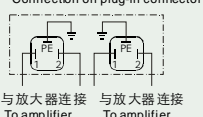
BFW 型 (type)	欧洲制式的放大器 <sup>2)</sup> Analogue amplifier in Eurocard format	VT-VSPA2-1-X/-... 参考 (RE) RC 30 112
BFW N 型 (type)	欧洲制式的数字式放大器 <sup>3)</sup> Digital amplifier in Eurocard format	VT-VSPD-1-X 参考 (RE) RC 30 123
	模拟式指令模组 Analogue command value module	内置于阀内 参考第4页 Integrated into the valves, see page 4
电源电压 Supply voltage	额定电压 Nominal voltage	VDC 24
BFW N	下限值 Lower limiting value	V 21/22 19
BFW I	上限值 Upper limiting value	V 3.5
放大器的电流消耗 Amplifier current consumption	$I_{max}$	A 1.8 1.8
	最大脉冲电流 Max. impulse current	A 3 3

1) 华液公司的控制放大器另选; 2) 由于电磁铁线圈表面温度可能升高, 请遵守欧洲标准 EN 563 及 EN 982  
Due to the occurring surface temperature of the solenoid coils, the European Standards DIN EN 563 and DIN EN 982 must be taken into account! With HOYE Machinery Manufacture LTD. control electronics

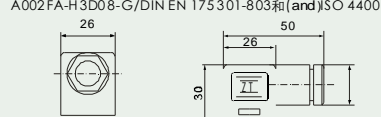
## 电气接线和插头 Electrical connection, plug-in connectors

BFW 型 (type) (不带内置放大器—不适用于结构形式 "J"—抗海水腐蚀)

(Without integrated electronics not for version "J" = sea water resistant)

插座连接形式  
Connection on component plug插头连接形式  
Connection on plug-in connector

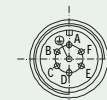
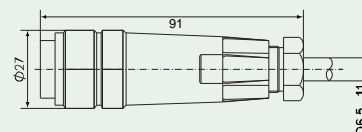
插座符合标准 Plug-in connector: CECC 75301-803-A002-FA-H3D08-G/DIN EN 175301-803 和 (and) ISO 4400



## BFWN 型 (type)

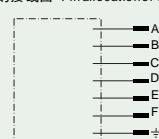
(带内置放大器, 适用于结构形式 "J"—抗海水腐蚀) 插头设置参考第4页的方块图  
For type BFWN (with integrated electronics (OBE) and for version "J" = sea water resistant)  
Plug-in connector see page 4

插座符合标准 Plug-in connector:  
DIN 43 563-BF6-3/Pg 11



## BFWN 型的内置放大器 Integrated electronics for type BFWN

插头的接线图 Pin allocation of the component plug



	接点 Contact	信号 Signal
电源 Supply	A	24VDC (19~35VDC)
电压 voltage	B	GND
	C	未接 <sup>1)</sup> n.c.
差动输入 Differential amplifier input	D	给定值 Com. Value (± 10V/4-20mA)
	E	基准电位 reference potential
	F	未接 <sup>1)</sup> n.c.

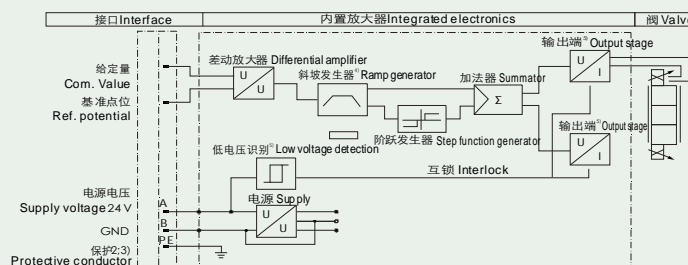
给定值: 加在 D, E 上正的给定输入值 (0 至 10V 或 12 至 20 mA) 会使阀上 P 口到 A 口, B 口到 T 口接通。  
加在 D, E 上负的给定输入值 (0 至 -10V 或 -12 至 -4 mA) 会使阀上 P 口到 B 口, A 口到 T 口接通。  
对于只在 "o" 侧装有电磁铁的阀 (阀芯结构为 EA 和 WA), 加在 D, E 上正的给定输入值。  
(通径 6: 4 至 20 mA 和通径 10: 12 至 20 mA) 会使 P 口到 B 口, A 口到 T 口接通。

Com. Value: Positive command value (0 to 10 V or 12 to 20 mA) at D and reference potential to E causes flow from P to A and B to T. Negative command value (0 to -10 V or -12 to -4 mA) at D and reference potential to E causes flow from P to B and A to T. For valves with a solenoid on side "o" spool variants EA and WA) a positive command value at D and reference potential to E (NS 6: 4 to 20 mA and NS 10: 12 to 20 mA) causes flow from P to B and A to T.

连接电缆: 推荐: — 可长至 25 m 型 LiCY 5 x 0.75 mm<sup>2</sup>  
— 可长至 50 m 型 LiCY 5 x 1.0 mm<sup>2</sup>  
电缆外径为 6.5 至 11 mm  
屏蔽只允许接在电源端的 PE。

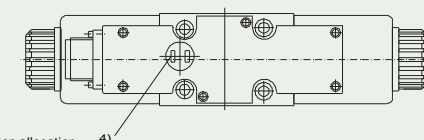
Connection cable; Recommendation:  
- up to 25 m cable length type LiCY 5 x 0.75 mm<sup>2</sup>  
- up to 50 m cable length type LiCY 5 x 1.0 mm<sup>2</sup>  
External diameter 6.5 to 11 mm  
Connect screen to PE only on the supply side

## 内置放大器的方块图/接线图 Block circuit diagram / connection allocation

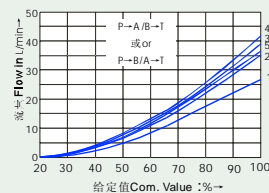


- 1) 接点 C 和 F 不允许连接在一起! 内置放大器的方块图/接线图
- 2) PE 与阀体和温度较低的物体相接
- 3) 保护线与阀体端盖相接
- 4) 斜坡时间可从外部在 0 到 2.5 s 范围内调整; 同样适用  $T_{up}$  和  $T_{down}$
- 5) 输出端为电流输出
- 6) BFWN I 0-2X 型不带低电压识别

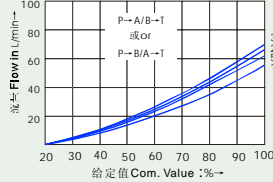
- 1) Contacts C and F must not be connected! Block circuit diagram / connection allocation
- 2) PE is connected to the cooling body and the valve housing
- 3) Protective conductor screwed to the valve housing and cover
- 4) Ramp can be externally adjusted from 0 to 2.5 s; the same applies for  $T_{up}$  and  $T_{down}$
- 5) Output stages current regulated
- 6) Low voltage detection is not carried out for component type 4WRAE 10-2X



30 l/min nominal flow at pressure differential 10 bar

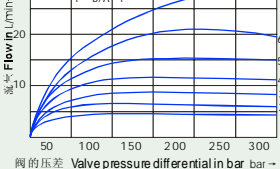


60 l/min nominal flow at pressure differential 10 bar

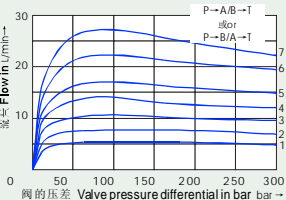


1  $\Delta p=10$  bar 恒定 Constant  
 2  $\Delta p=20$  bar 恒定 Constant  
 3  $\Delta p=30$  bar 恒定 Constant  
 4  $\Delta p=50$  bar 恒定 Constant  
 5  $\Delta p=100$  bar 恒定 Constant  
 $\Delta p$ = 阀的压差 (入口压力  $P_1$  减去负载压力  $P_L$  并减去回油压力  $P_2$ )  
 $\Delta p$ = Valve pressure differential  
 (inlet pressure  $P_1$  minus load  
 pressure  $P_L$  and minus return pressure  $P_2$ )

Performance limit, nominal flow 7 L/min



BFW和(and)BFWN型(type)  
 额定流量为15 L/min的功率极限  
 Performance limit, nominal flow 15 L/min



1 给定值 Com. Value=40%  
2 给定值 Com. Value=50%  
3 给定值 Com. Value=60%  
4 给定值 Com. Value=70%  
5 给定值 Com. Value=80%  
6 给定值 Com. Value=90%  
7 给定值 Com. Value=100%

如果超过阀的功率极限，阀芯的运动将失稳。  
If the performance limits are exceeded then flow force occurs which lead the spool movement uncontrolled.

- 1 阀体 Valve housing
- 2 比例电磁铁 Proportional solenoid "a"
- 3 比例电磁铁 Proportional solenoid "b"
- 4 1.4.2 黑色插头参考第3页 Plug-in connector, colour black,  
separate order see page 3
- 5 铭牌 Name plate
- 6 C形圈 8.73 x 1.78 (用于油口 A, B, P, T)  
8.73 x 1.78 Identical seal rings for ports A, B, P and T
- 7 带有一个电磁铁的阀的丝堵 (两位阀, 机能为2B2B或2B40B)  
Plug for valves with one solenoid (2 switching positions,  
versions 2B2B or 2B40B)
- 8 取下插头所需空间 Space required to remove the plug-in connector
- 9 阀底座, 底座符合 Machined valve mounting surface, Connection  
location to DIN 24 340, A, ISO4401 1和1) CETOP-RP 121 H

安装底板 Subplates: G341/01(G1/4)  
G342/01(G3/8) G502/01(G1/2)  
阀固定螺栓 Valve fixing screws: 4个M5x 50 DIN 912-10.9;  
M<sub>2</sub>=8.9 Nm

- 1 阀体 Valve housing
- 2 比例电磁铁 Proportional solenoid “a”
- 3 比例电磁铁 Proportional solenoid “b”
- 4.1 4.2 黑色插头参考第3页 Plug-in connector , colour black,  
separate order see page 3
- 5 铭牌 Name plate
- 6 阀的排气螺栓 Valve deflation screw
- 7 O形圈 12 x2 (用于油口 A, B, P, T)  
12 x 2 Identical seal rings for ports A, B, P and T
- 8 带有一个电磁铁的阀的丝堵 (两位阀, 机能为2B2B或2B40B)  
Plug for valves with one solenoid ( 2 switched positions,  
versions 2B2B or 2B40B)
- 9 取下插头所需空间 Space required to remove the plug-in connector
- 10 阀底面, 底板板架 Machined valve mounting surface, Connection  
location to DIN 24340/A, ISO4401和(和) CETOP-RP 121 H

安装底板 Subplates: G66/01 (G3/8)  
G67/01 (G1/2) G534/01 (G3/4)  
阀固定螺栓 Valve fixing screws: 4个 M6x 40 DIN 912-10.9;  
M<sub>n</sub> = 15.5 Nm

- 1 阀体 Valve housing
- 2 比例电磁铁 Proportional solenoid "a"
- 3 比例电磁铁 Proportional solenoid "b"
- 4 插头符合 Plug-in connector to EDIN 43563-BF6-3/Pg11,  
参考第4页 see page 4
- 5 铭牌 Name plate
- 6 O形圈 8.73 x 1.78 (用于油口 A, B, P, T)  
8.73 x 1.78 identical seal rings for ports A, B, P and T
- 7 带有一个电磁铁线圈的丝堵 (两位置, 机能为2B2B或2B40B)  
Plug for valves with one solenoid (2 switched positions,  
versions 2B2B or 2B40B)
- 8 内置式放大器 Integrated electronics
- 9 连接电缆和取下插头所需空间 Space required for the  
connection cable and to remove the plug-in connector
- 10 阀底面, 底板符合 Machined valve mounting surface, Connection  
location DIN 24340A, ISO 4401 (and) CETOP-RP 121 H

安装底板 Subplates: G341/01 (G1/4) G342/01 (G3/8) G502/01 (G1/2)  
 阀固定螺栓 Valve fixing screws: 4个 M5x50 DIN 912-10.9;  
 $M_s=8.9 \text{ Nm}$

- 1 阀体 Valve housing
- 2 比例电磁铁 Proportional solenoid “C”
- 3 比例电磁铁 Proportional solenoid “B”
- 4 插头符合 E DIN 43 563-BF6-3/Pg11, 参考第4页 Plug-in connector colour black, separate order see page 4
- 5 铭牌 Name plate
- 6 阀的排气螺栓 Valve deflation screw
- 7 O形圈 12x2 (用于油口 A, B, P, T)  
12 x 2 Identical seal rings for ports A, B, P and T  
带有一个电磁铁的阀的端堵 (两位阀, 机能为2B2C或2B40B)  
Plug for valves with one solenoid (2 switched positions, versions 2B2C or 2B40B)
- 9 内置式放大器 Integrated electronics
- 10 连接电缆和取下插头所需空间 Space required for the connection cable and to remove the plug-in connector
- 11 阀底面, 底板符合 Mached valve mounting surface, Connection to DIN 24 340 A, ISO4401和( and ) CETOP-RP 121 H

安装底板 Subplates: G66/01 (G3/8)  
G67/01 (G1/2) G534/01 (G3/4)  
阀固定螺栓 Valve fixing screws: 4个 M6x 40 DIN 912-10.9;  
M<sub>2</sub> = 5.5 Nm